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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/756,771	01/14/2004	Kunikazu Kuchino	KUCH3002/EM	2338
23364 7590 08/14/2008 BACON & THOMAS, PLLC 625 SLATERS LANE FOURTH FLOOR ALEXANDRIA, VA 22314-1176				
EXAMINER				
KITOV, ZEEV V				
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2836				
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

Application No.

10/756,771

Applicant(s)

KUCHINO ET AL.

Examiner

ZEEV KITOV

Art Unit

2836

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 23 May 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1 - 37 is/are pending in the application.
- 4a) Of the above claim(s) 4, 5, 7, 8, 12, 13, 21, 29 - 37 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 3, 6, 9 - 11, 14 - 20, 22 - 28 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB08)  
Paper No(s)/Mail Date 01/14/04.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application.
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

Applicant's election without traverse of Invention I including claims 1, 2, 3, 6, 9, 10, 11, 14, 15, 16 – 20 and 22 – 28 is acknowledged.

#### ***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 9, 10, 11 and 25 - 28 are rejected under 35 U.S.C. 102(b) as being anticipated by Fuji (US 6,159,421). Regarding Claim 1, Fuji discloses following: a photoelectron generating plate (2 in Fig. 4) comprising a photoelectron emission layer on a substrate (col. 9, line 28 – col. 10, line 7) for emitting photoelectrons by an illumination of a light (1 in Fig. 4) and inherently having a barrier property. It is well known in the art and supported by the evidence from on-line Encyclopedia Answers.com as follows: "When a metallic surface is exposed to electromagnetic radiation above a threshold frequency (which is specific to the surface of the material), the photons are absorbed and current is produced. No electrons are emitted for radiation with a frequency below that of the threshold because the electrons are unable to gain sufficient energy to overcome the electrostatic barrier presented by the termination of the crystalline surface (the material's work function). By the law of

conservation of energy, the electron absorbs the energy of the photon and if sufficient, the electron can escape the material with a finite kinetic energy".

Regarding Claims 9 and 10, Fuji discloses the photoelectron emission layer being made of a ceramic material such as titanium carbide (col. 19, lines 1 – 21).

Regarding Claim 11, Fuji discloses the device having the photoelectron generating plate (2 in Fig. 6) and a light source for emitting the light (1 in Fig. 6).

Regarding Claim 25, Fuji discloses a mesh-shaped photoelectron generating member (col. 6, lines 21 – 29). All other elements of the claim are disclosed above (see Claim 1 rejection above).

Regarding Claim 26, Fuji discloses the light source generating an ultraviolet light (1 in Fig. 25).

Regarding Claim 27, Fuji discloses a structure including an ultraviolet lamp (1 in Fig. 25) surrounded by a mesh electrode (51 in Fig. 25) which is read on a mesh-shaped conductive member, which, in turn, is surrounded by a ceramic member 47 in Fig. 25) having a photocatalyst (in Fig. 25) 2 and a photoelectron emitter (45 in Fig. 25) attached thereto.

Regarding Claim 28, Fuji discloses the ventilator (Fan) (34 in Fig. 14) providing the air flow to the photoelectron generating device, which according to him may include a mesh-shaped photocatalytic layer (col. 6, lines 21 – 29).

***Claim Rejections - 35 USC § 103***

Claims 6 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji. As per Claim 6, it requires the thickness of the photoelectron layer being greater than a maximum surface roughness of the underlying layer. It would have been obvious to one of ordinary skill in the art at the time the invention was made to select a thickness of the photoelectron emitting layer being larger than the roughness of the underlying layer since, otherwise the photoelectron emitting layer would have too rough and uneven surface that it would not be able to efficiently emit electrons when being irradiated by the light source.

Claims 2 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Ogawa et al. (US 6,106,955). Regarding Claims 2, and 3 Ogawa et al. disclose the photo-catalytic structure with a conductive substrate (12 in Fig. 1), which is being formed of stainless steel (col. 3, lines 45 – 56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by using the stainless steel as a substrate a material, because (I) according to Ogawa et al. (col. 8, lines 48 – 51), such selection makes possible to form a second (intermediate) layer by anodizing another material on the substrate surface thus forming a strong bond resistant to peeling, and (II) when the stainless steel substrate is used in the Fuji structure, it may be used as an electrode for forming an electrostatic field trap for negatively charged particles between the substrate and active electrode.

Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Hayashi et al. (JP 2001187390). Regarding Claim 14, Hayashi et al. disclose the oxygen gas running through the surface of photoelectron generating plate (see Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the oxygen gas flowing into photoelectron generating plate in order to form the ozone since, as well known in the art, the ozone helps to purify the liquids and gases.

Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Watanabe et al. (US 5,853,866) or Greenberg et al. (US 7,049,002). Regarding Claim 15, Watanabe et al. disclose a photo-catalytic formation (Fig. 9, col. 9, lines 13 - 19) including three layers, the substrate (1 in Fig. 9), a second intermediate layer on a top of the substrate (6 in Fig. 9) and photo-catalytic layer (2 in Fig. 9) producing the photo-catalytic effect, i.e. being irradiated with ultra-violet light it produces a purifying effect in the air (col. 1, lines 14 - 58). Watanabe et al. were not certain regarding a nature of the obtained antibacterial effect in the air and developed they own theory as to how the antibacterial effect is achieved (col. 9, line 58 - col., 10, line 14). However, as well known in the art, the ionized air with dominating negative particles produces the same antibacterial effect. Therefore, it is quite clear that the antibacterial effect of Watanabe is achieved due to ionization of the air, i.e. due to emission of electrons into the air under influence of the ultra-violet radiation.

The intermediate layer of the disclosed structure is a binder layer (6 in Fig. 9), which as all other elements and materials possesses an electrostatic potential barrier (see Claim 1 rejection above), since otherwise, it would be losing its electrons by a free emission into the air even without being irradiated, which is not the case. It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the Fuji et al. system by adding the intermediate layer according to teachings of Watanabe et al., because it is necessary for binding the substrate and photo-catalytic layer together and provide an isolation between the substrate and the photo-catalytic layer.

Alternatively, Claim 15 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al. (US 7,049,002). Regarding Claim 15, Greenberg et al. disclose a photo-catalytic structure including three-layers with a barrier (intermediate) layer having a barrier property on a substrate (22 in Fig. 2) and a photoelectron emission layer (24 in Fig. 2) disposed on the barrier layer and emitting photoelectrons under illumination of a light thereon. According to Greenberg et al., the upper layer may be formed of titanium dioxide, which as well known in the art possesses the photo-emitting properties being subjected to ultraviolet radiation. As to barrier properties of the intermediate layer, according to Greenberg et al. (col. 10, lines 1 – 6), may be formed of amorphous or crystalline metal oxides including cobalt oxides, chromium oxides and iron oxides, tin oxides, silicon oxides, titanium oxides, zirconium oxides, fluorine-doped tin oxides, aluminum oxides, magnesium oxides, zinc oxides, i.e. the elements, which as well known in the art, inherently possess the barrier feature. It would have been

obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by providing an additional (intermediate) layer according to teachings of Greenberg et al., because as Greenberg et al. state (col. 9, lines 56 – 67) it provides an isolation thus preventing sodium ions migration from the substrate to the upper layer coating.

Regarding Claim 16, Watanabe et al. discloses the barrier layer (intermediate layer 6 in Fig. 9) containing the same photo-catalytic particles (3 in Fig. 9) as the photo-catalytic layer (2 in Fig. 9). Fuji discloses the photo-catalytic material including aluminum oxide  $Al_2O_3$  or  $TiO_2$ , (col. 19, lines 1 – 21). Therefore in the Fuji system modified according to teachings of Watanabe et al., the barrier (intermediate) layer will include the aluminum oxide. A motivation for modification of the primary reference is the same as above.

Claims 17, 19, 20, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al. and Ogawa et al. (US 6,106,955). Regarding Claims 2, 19 and 20, Ogawa et al. disclose the photo-catalytic structure with a conductive substrate (12 in Fig. 1), which is being formed of stainless steel (col. 3, lines 45 – 56). It would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the Fuji structure by using the stainless steel as a substrate a material, because (I) according to Ogawa et al. (col. 8, lines 48 – 51), such selection makes possible to form a second (intermediate) layer by anodizing another material on the substrate surface thus forming a strong bond resistant to



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peeling, and (II) when the stainless steel substrate is used in the Fuji structure, it may be used as an electrode for forming an electrostatic field trap for negatively charged particles between the substrate and active electrode.

Regarding Claim 23, Fuji discloses the light source for emitting the light (1 in Fig. 6).

Claim 24 is rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Greenberg et al., Ogawa et al. and Hayashi et al. (JP 2001187390). Regarding Claim 14, Hayashi et al. disclose the oxygen gas running through the surface of photoelectron generating plate (see Abstract). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide the oxygen gas flowing into photoelectron generating plate in order to form the ozone since, as well known in the art, the ozone helps to purify the liquids and gases.

Claims 16 – 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Fuji in view of Ogawa and Greenberg et al. Regarding Claims 16 and 17, Greenberg et al. disclose the barrier (intermediate layer being formed of aluminum oxide (col. 10, lines 1 – 6), which is inherently conductive. It would have been obvious to one of ordinary skill in the art at the time the invention was made to have made the barrier of aluminum oxide, which is conductive material, because the aluminum oxide is one of the list of materials satisfying both requirements, i.e. providing a good barrier for sodium ions diffusion and at the same time providing a good surface suitable for deposition of the titanium dioxide (col. 2, lines 49 – 59).

Regarding Claim 18, Greenberg et al. disclose the barrier (intermediate) layer being formed of tin oxide (col. 10, lines 1 – 6).

***Conclusion***

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Zeev Kitov whose current telephone number is (571) 272 - 2052. The examiner can normally be reached on 8:00 – 4:30. If attempts to reach examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on (571) 272 – 2800, Ext. 36. The fax phone number for organization where this application or proceedings is assigned is (571) 273-8300 for all communications.

/Michael J Sherry/  
Supervisory Patent Examiner, Art Unit 2836

/Z. K./  
Examiner, Art Unit 2836  
8/4/2008